

## **REMARKS/ARGUMENTS**

Applicant thanks Examiner for the detailed Office Action dated April 12, 2006. In response to the issues raised, the Applicant offers the following submissions and amendments. Furthermore, we enclose a Terminal Disclaimer linking the term and ownership of any patent granted on the present application to that of co-pending USSN 10/773,196.

### **Amendments**

Page 1 of the specification is amended to update Cross Reference to Related Application information.

The Abstract has been amended to avoid the use of claim-like terms.

Claims 1, 19 and 38 have been amended to clarify the features distinguishing the present invention from the cited references.

Claims 4, 22 and 41 have been amended to address the minor typographical errors identified by the Examiner.

Accordingly, the amendments do not add any new matter.

### **Abstract**

As discussed above, we believe that the amended Abstract provides a clear and concise description of the disclosure in compliance with 37 CFR 1.72.

### **Non-Statutory Double Patenting**

We trust the enclosed Terminal Disclaimer addresses this issue.

### **35 USC §102**

Claims 1 and 19, *inter alia*, stand rejected for lack of novelty in light of US 5,841,452 to Silverbrook. The Applicant disagrees.

Independent claims 1 and 19 define the heater element to be a planar structure that is suspended in the nozzle chamber parallel to the nozzle plate defining the ejection apertures. Suspending the heater element in the chamber greatly improves the efficiency of the printhead. The heat generated by the heater element is isolated from the substrate and chamber by the ink. Some heat is conducted back through the electrode portions into the substrate, however the majority is used for generating the vapor bubble. With less heat dissipation into the substrate, the drive circuitry for each unit cell (i.e. nozzle, chamber, heater and drive circuitry) can be deposited relatively close to the heater. In the '452 reference, the drive circuitry is located as far as possible from the heaters because of the heat generated in the substrate (see col.13, ll. 18-27). This means that conductive paths need to extend from the drive transistors to the heaters at the chamber. These conductive paths have inherent resistance which further decrease efficiency and generate waste heat.

Configuring the heater element so that it is in a plane parallel to the nozzle plate has important advantages for close packed nozzles (less than 100 microns apart) formed by photolithographic etching and deposition techniques. Firstly, forming the heater in the plane of deposition (the plane of the wafer) is considerably less complicated than forming a transverse heater from a fabrication point of view. Secondly, the pressure pulse from a bubble generated by a heater element parallel to the nozzle aperture provides a drop trajectory that is more likely to be normal to the nozzle plate. The shape of the pulse and its direction of movement through the chamber to the nozzle is much less likely to skew the path of the ejected drop.

The '452 reference fails to teach a suspended heater element that is parallel to the nozzle plate. Because of this it needs the thermal shunt to actively dissipate heat from the chamber wall, and must position the drive transistors and logic remote from the nozzle. Accordingly, the citation fails to anticipate claims 1 and 19 or any of dependent claims.

### **35 USC §103**

Claims 3, 4, 7, 9 – 12, 14-18, 21 – 23, 26, 28 – 31, and 33 - 54 stand rejected as obvious in light of '452 to Silverbrook in combination with common knowledge in this field of technology, US 6,045, 710 to Silverbrook, US 5,706,041 to Kubby, US 5,710,070 to Chan, US 5,856,836 to Silverbrook, US 6,543,879 to Feinn et al, US 6,447,104 to Keil et al, US 4,797,692 to Kashino et al, US 4,965,584 to Komuro, or US 4,931,813 to Pan et al.

Similarly, claim 38 stands rejected as obvious in light of '452 to Silverbrook in view of US 4,549,191 to Fukuchi et al. Dependent claims 39 to 54 stand rejected as obvious in light of '452 to Silverbrook in view of Fukuchi in further view of the references listed above.

As discussed above, '452 to Silverbrook fails to anticipate all the elements of amended claims 1 and 19. Likewise '452 to Silverbrook and Fukuchi fail to disclose all the elements of independent claim 38. Furthermore, none of the cited references teach or suggest a heater element suspended in the chamber parallel to the nozzle plate so that the lithographically formed printhead has a nozzle spacing of less than 100 microns.

It follows that the citations fail to support a §103 rejection of the above claims.

### **Conclusion**

It is respectfully submitted that the Examiner's objections and rejections have been successfully traversed and the application is now in condition for allowance. Accordingly, favorable reconsideration is courteously solicited.

Very respectfully,

Applicant:



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